

JANUARY 29, 2010, Pump Pressure Reports / PSA Distribution Replacement Project Report  
PSA 2007-2010 Water Cmte. Reports from Larry Pazaski files Sept. 21, 2024  
1-29-10

COPY

TO: PSA BOB SECRETARY, Sue Loro  
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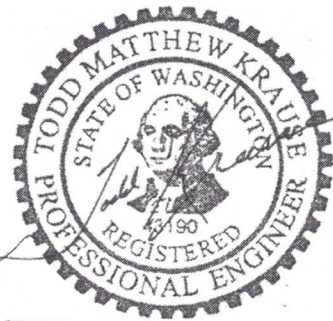
1-29-10  
JANUARY 29, 2010  
EMAILED TO

NOT Full Report - Key Pages ONLY  
PSA PRESIDENT, MERRISUE STEWART  
& GEORGE YOUNG BOARD & WIC MEMBER

NORTH WELL NEW PUMPHOUSE UPGRADES. WENT ONLINE IN 2009  
SPECIFICATIONS

SAVE. IMPORTANT INFO.  
ON Pump CAPACITY AND PRESSURES  
DELIVERED TO PSA PROPERTIES

DISTRIBUTION REPLACEMENT PROJECT REPORT  
FOR  
PARADISE ESTATES  
WATER SYSTEM



EXPIRES 8-29-09  
May 7, 2008

PROJECT NUMBER  
08012201

NORTHWEST WATER SYSTEMS, INC.  
P.O. BOX 123  
PORT ORCHARD, WA 98366  
(360)876-0958

3/12

# Project Report for the Paradise Estates Water System

## 1.0 System Description

The Paradise Estates Water System is an existing water system located in Mason County on the east shore of Mason Lake. The system is served by three wells (two primary and one emergency) and two reservoirs with a total capacity of 144,000 gallons of storage. The existing 4-inch and 2-inch distribution system has two pressure zones: one gravity, fed from the reservoirs and one pressurized by two booster pumps controlled with pressure switches and a large hydropneumatic tank..

Water System Name:	Paradise Estates Water System
WSDOH ID Number:	66125T
Name of Owner:	Paradise Service Associates.
Owner Contact:	Bill Davies
Owner Address:	371 East Mason Lake Drive East Grapeview, WA 98564
Owner Phone:	(360) 426-3901
Type of Management:	Satellite Management Agency
Name of SMA:	Northwest Water Systems, Inc.
SMA Contact:	Reg Hearn
SMA Address:	P.O. Box 123 Port Orchard, WA 98366
SMA Phone:	(360) 876-0958

## 2.0 Project Scope

The community desires to replace their entire distribution system and upgrade it with the capability to provide fireflow. The following is a summary of the proposed upgrades:

1. Replace the Distribution System with 8", 6" and 2" Pipe
2. Replace the existing Booster Station with three new Booster Pumps to Provide Regular Demands as well as 500 gpm Fireflow at PHD
3. Simplify the Distribution System to a Single Pressure Zone by replacing the pressure switches and hydropneumatic tank with a Variable Frequency Drive (VFD) and small bladder tank.

## 3.0 Planning

This project is submitted as a follow-up project to the approved Small Water System Management Program. The SWSMP listed replacement of the distribution system as one of the proposed improvements. This report is submitted to accomplish this upgrade.

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3/12

#### 4.0 Analysis of Alternatives

As a simple system there are not a large number of alternatives to be explored. Pump controls and pressure zones were the primary features with possible (interrelated) alternatives. If a Variable Frequency Drive (VFD) controller is used for the primary distribution system pumps, then a single pressure zone can achieve acceptable pressure to all customers. Because of the many advantages associated with VFD controls (pump protection, trouble shooting data, electrical savings) combined with the simplification of the distribution system into a single pressure zone, this was the chosen alternative.

#### 5.0 Water Quality

Water quality is acceptable with no contaminants near levels listed in the Federal or State guidelines. No treatment is necessary nor proposed. The project has no direct impact on water quality; however, the new distribution system will reduce leakage and limit the opportunity for coliform contamination in the distribution system.

#### 6.0 Water Quantity and Water Rights

This project has no direct impact on water rights. It is assumed that the system has several leaks both on the system and customer side of the shut-off. Therefore, it is anticipated that installation of service meters and a reduction in watermain leaks will greatly reduce the volume of water pumped and assist the system in maintaining compliance with their water rights.

#### 7.0 Design Criteria

Unless otherwise noted the Washington State Department of Health Water System Design Manual was used as the primary design criteria.

#### 8.0 Engineering Calculations

##### 8.1 Background Information

The following background information is included in the SWSMP or from the analysis that follows:

Number of Residential Connections:	156
Number of Potential Connections	190
Average Daily Demand (ADD)	346 gpd
Maximum Daily Demand (MDD)	692 gpd
PHD <sub>(190 connections)</sub>	237 gpm

##### 8.2 Sizing and Calculations of System Components

ADD was determined based upon rainfall data (as noted as an option in the SWSMP). The system has multiple known leaks, which artificially raise ADD based upon source meter readings. The only difference for this design between using ADD based upon rainfall instead of upon meter readings is in the sizing of the booster pumps. If it is determined at some point in the future that actual PHD is higher than the calculated PHD, an additional booster pump could easily be added to the system.

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Mason County requires a minimum fireflow of 500 gpm at 20 psi for existing water systems. This flow needs to be available during the PHD condition. Therefore, a minimum of 740 gpm (500 gpm fireflow + 237 gpm PHD) is required.

The booster station is designed to utilize three pumps: two identical 5 hp pumps (Pumps 1 and 2, Goulds 3MC-G) and a 10 hp pump (Pump 3, Goulds 12AI/BF-D). For the PHD condition the specified 5 hp booster pumps are sized to provide 180 gpm each for a total of 360 gpm at 30 psi to the highest connection. This provides more than the minimum required flow of 237 gpm for the normal operating condition.

### 8.3 System Controls

The pumps shall be controlled in the following manner:

- Pump 1: VFD set to 40 psi
- Pump 2: Pressure Switch set to 35/42 psi
- Pump 3: Pressure Switch set to 25/35

Pump protection shall be provided to Pump 1 through the VFD controller. Pump protection for Pump 2 shall only be needed if pump 1 were to fail. This protection shall be provided through a relay from the VFD that locks out pumps 2 and 3 in the Auto mode if Pump 1 experiences a default for any reason. A warning light located on the outside of the pumphouse will also come on at the same time.

While Pump 1 is being reset, Pump 2 can be activated by opening the re-circulation valve and activating Pump 2 in "manual" mode. The valve can then be slowly closed until the pressure at the manifold reads approximately 40 psi.

A time delay switch set to 1 minute and 2 minutes, respectively shall be installed on pumps 2 and 3. This will prevent all pumps from re-starting at once in the event of a power outage or other emergency.

### 8.4 Hydraulic Analysis

The full hydraulic analysis is located in the appendix. The system has two conditions for which the analysis is critical: static pressure and maximum fireflow.

During the static pressure condition homes located near the lake elevation will have a normal pressure of 85 psi. This pressure could peak as high as 87 psi as pump 2 meets its cut-out pressure. All homes at elevations below ~225 feet in elevation will be notified that their pressure may exceed 80 psi and that they may want to install a pressure reducing valve. A copy of a sample letter is included in the appendix.

During a fireflow event the system is required to maintain a minimum pressure of 20 psi throughout the entire distribution system. The worst case (lowest pressure) point in the distribution system is located at the highest point in elevation (node J-18) with 500 gpm flowing at the fire hydrant located near the corner of lots 123 and 124 with the PHD condition throughout the rest of the system. Under these conditions 25 psi is maintained at the worst case point (J-18). The booster station can support a peak flow of

6/12

approximately 850 gpm and maintain 20 psi under the worst case condition. With normal water use (not PHD), a capacity of at least 750 gpm will be available for fire fighting.

Headloss in the proposed distribution system is very small, even during a fireflow event. Therefore, additional booster pump capacity could easily be integrated into the system if additional fireflow is required or desired in the future.

A by-pass shall be installed in the pumphouse from the reservoir directly into the distribution system through the use of a check valve between the suction and pressure mainfolds. This bypass will allow the system to remain "in water" if the booster station should be out of service from a power outage or catastrophic event. This will not maintain 20 psi to all homes, but it will maintain positive pressure on the entire distribution system as the reservoir base is slightly above the highest portion of pipe.

### **9.0 Legal Considerations**

The Paradise Estates Water System is owned by the Paradise Service Associates and governed by their rules and bylaws. The system has a current and approved Mason County Franchise Agreement and adheres to its provisions.

### **10.0 Operation and Maintenance Considerations**

The system has a current contract with a Satellite Management Agency, Northwest Water Systems. Most of the operation and maintenance considerations for this system do not change as a result of this project. The following are additional procedures that need to be followed upon completion of the project:

#### **10.1 Booster Pump Operation**

It is likely that booster pumps 2 and 3 will rarely operate given the present population. Therefore, these pumps should be exercised every quarter. The pumps are to be equipped with Hand-Off-Auto controls. The pump shall operate for a minimum of five minutes before being switched back to "auto". The pump shall be observed while in operation for vibration, noise, smell, and other conditions indicating if it requires servicing.

#### **10.2 Distribution System**

All valves shall be exercised at least once each year. Valves shall be exercised by turning them to the fully closed and then fully open positions. The number of turns shall be counted in each direction. If a different number of turns are required to perform either operation, the valve shall be inspected and repaired or replaced as needed.

Service meters will be read a minimum of bi-monthly. An annual water audit shall be performed as required by the Water Use Efficiency Rule.

#### **10.3 Miscellaneous Considerations**

The system should follow all manufacturers' recommendations in operation and maintenance procedures. All practices should be performed in a safe and professional manner. In all procedures consideration for the customers, other utilities, property owners, and the system itself should be given.

2/12

## Appendices

Emergency Booster Station O&M Procedures  
Booster Pump Specifications  
Variable Frequency Drive Specification  
Pressure Tank Specification  
Hydraulic Analysis  
Standards and Details  
North Well Site Overview  
Pumphouse Layout  
Distribution System Layout

8/12

## Emergency Booster Pump Operation for Paradise Estates Water System

If Booster Pump 1 fails a default relay will prevent Booster Pumps 2 and 3 from operating in "Auto" mode.

To pressurize the system while booster pump 1 is being repaired, the following procedure shall be followed:

1. Open re-circulation valve to the Full Open position
2. Turn Booster Pump 2 to the "Hand" (manual) position
3. Slowly close the re-circulation valve until pressure reaches 40 psi
4. When Pump 1 is operational put it on-line
5. Switch Pump 2 to "Auto"
6. Close re-circulation valve to fully closed

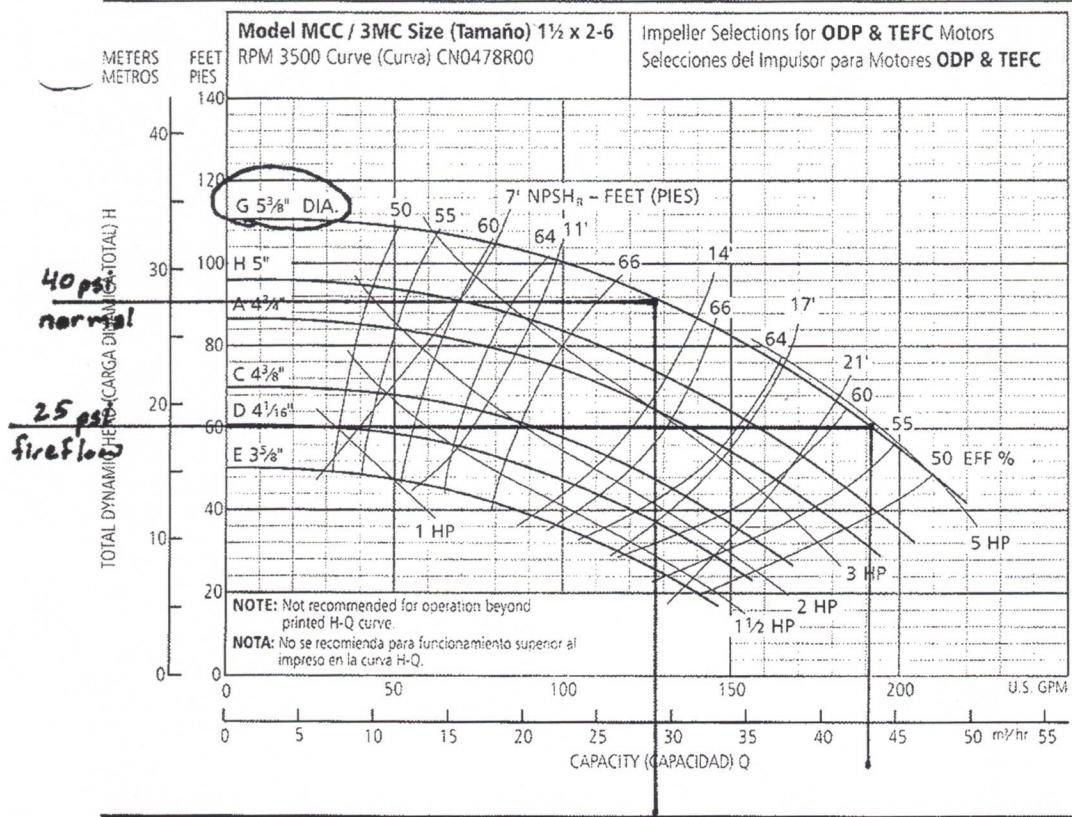
Insert these instructions into the SWSMP and Post on Pumphouse wall in a plastic protective covering.

9/12

**Performance Curves – 60 Hz, 3500 RPM**

**Curvas de desempeño – 60 Hz, 3500 RPM**

**Booster 1:2**

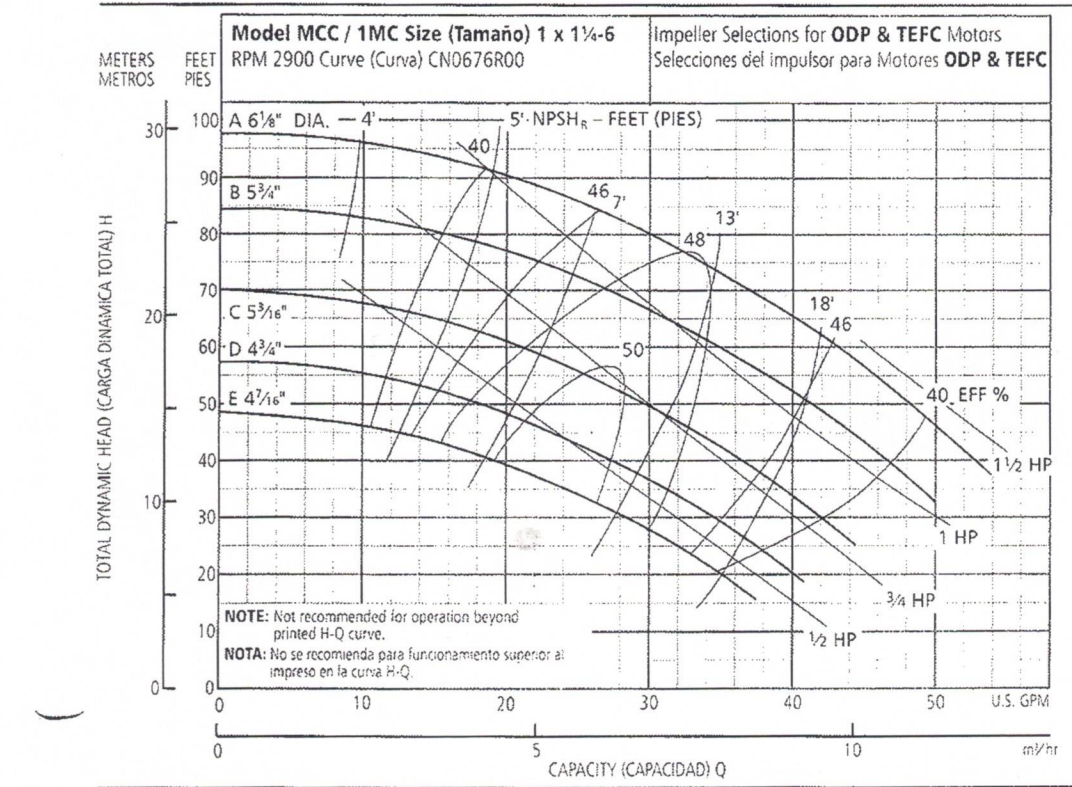


Ordering Code, Código de Pedido	Standard HP Rating, Capacidad HP estándar	Imp. Dia.
E	1	3 5/8"
D	1 1/2	4 1/16"
C	2	4 3/8"
A	3	4 3/4"
H	5	5"
G	5	5 3/8"

NOTE: Although not recommended, the pump may pass a 1 1/32" sphere.  
 NOTA: Si bien no se recomienda, la bomba puede pasar una esfera de 1 1/32".

**Performance Curves – 50 Hz, 2900 RPM**

**Curvas de desempeño – 50 Hz, 2900 RPM**



Ordering Code, Código de Pedido	Standard HP Rating, Capacidad HP estándar	Imp. Dia.
E	1/2	4 7/16"
D	1/2	4 3/4"
C	3/4	5 3/16"
B	1	5 3/4"
A	1 1/2	6 1/8"

NOTE: Although not recommended, the pump may pass a 1/16" sphere.  
 NOTA: Si bien no se recomienda, la bomba puede pasar una esfera de 1/16".



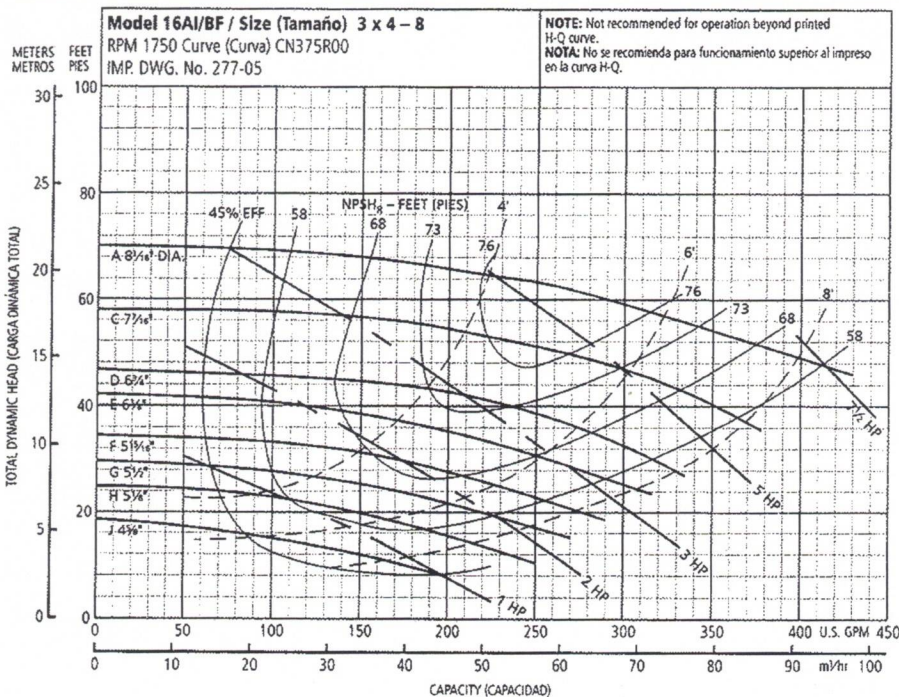
Pg 9

1-29-10 Pg 9 of 23

FIREFLOW  
Pump #3 DATA

10/12

Performance Curves – 60 Hz, 1750 RPM  
Curvas de desempeño – 60 Hz, 1750 RPM

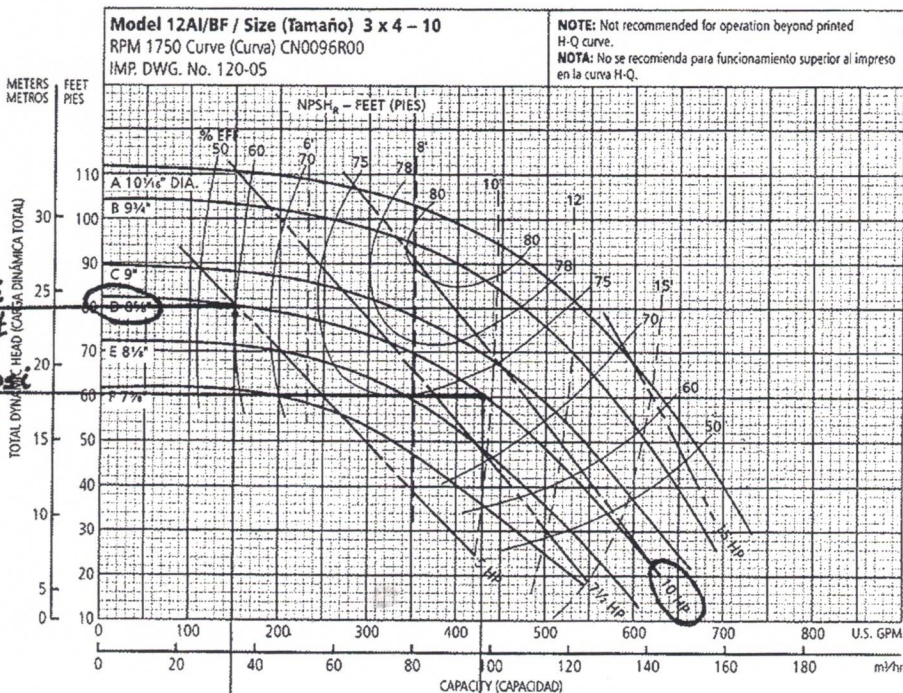


**Optional Impeller  
Impulsor optativo**

Ordering Code Código de pedido	Dia. Diá.
A	8 1/16"
C	7 7/16
D	6 3/4
E	6 3/8
F	5 15/16
G	5 1/2
H	5 1/8
J	4 3/8

NOTE: Pump will pass a sphere to 3/8" diameter.

NOTA: La bomba dejará pasar una esfera de hasta 3/8 de pulgada de diámetro.



**Optional Impeller  
Impulsor optativo**

Ordering Code Código de pedido	Dia. Diá.
A	10 1/16"
B	9 3/4
C	9
D	8 3/8
E	8 1/8
F	7 3/8

NOTE: Pump will pass a sphere to 3/8" diameter.

NOTA: La bomba dejará pasar una esfera de hasta 3/8 de pulgada de diámetro.

1-29-10 PSA 1-29-10  
NWS - PSA 1-29-10  
Fireflow Pump Pressures  
Pg 9 of 23 Fireflow Pump Pressures

PSI DATA  
Pg 11 of 23

Scenario: Base  
Steady State Analysis  
Junction Report

W/12

Paradise Estates Static Condition

Pg 12  
NWS-PSA STATIC LINE PRESSURE-LOCATION SPECIFIC

Label	Elevation (ft)	Zone	Type	Base Flow (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
J-3	300.00	Zone	Demand	0.00	Fixed	0.00	407.00	46.29
J-4	268.00	Zone	Demand	0.00	Fixed	0.00	407.00	60.14
J-5	242.00	Zone	Demand	0.00	Fixed	0.00	407.00	71.39
J-6	217.00	Zone	Demand	0.00	Fixed	0.00	407.00	82.20
J-7	218.00	Zone	Demand	0.00	Fixed	0.00	407.00	81.77
J-8	224.00	Zone	Demand	0.00	Fixed	0.00	407.00	79.18
J-9	217.00	Zone	Demand	0.00	Fixed	0.00	407.00	82.20
J-10	221.00	Zone	Demand	0.00	Fixed	0.00	407.00	80.47
J-11	254.00	Zone	Demand	0.00	Fixed	0.00	407.00	66.20
J-12	286.00	Zone	Demand	0.00	Fixed	0.00	407.00	52.35
J-13	228.00	Zone	Demand	0.00	Fixed	0.00	407.00	77.44
J-14	252.00	Zone	Demand	0.00	Fixed	0.00	407.00	67.06
J-15	220.00	Zone	Demand	0.00	Fixed	0.00	407.00	80.91
J-16	230.00	Zone	Demand	0.00	Fixed	0.00	407.00	76.58
J-1	310.00	Zone	Demand	0.00	Fixed	0.00	407.00	41.97
J-2	312.00	Zone	Demand	0.00	Fixed	0.00	407.00	41.10
J-18	315.00	Zone	Demand	0.00	Fixed	0.00	407.00	39.80
J-19	210.00	Zone	Demand	0.00	Fixed	0.00	407.00	85.23

Pg 12 of 23

Scenario: Base  
Steady State Analysis  
Junction Report

Paradise Estates Fireflow Condition

Pg 11 1-29-10  
NWS-PSA WATER DISTRIBUTION FIREFLOW DATA

Label	Elevation (ft)	Zone	Type	Base Flow (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
J-3	300.00	Zone	Demand	500.00	Fixed	500.00	360.61	26.22
J-4	268.00	Zone	Demand	30.00	Fixed	30.00	360.44	40.00
J-5	242.00	Zone	Demand	30.00	Fixed	30.00	360.21	51.14
J-6	217.00	Zone	Demand	30.00	Fixed	30.00	360.18	61.95
J-7	218.00	Zone	Demand	30.00	Fixed	30.00	360.18	61.52
J-8	224.00	Zone	Demand	30.00	Fixed	30.00	360.31	58.98
J-9	217.00	Zone	Demand	30.00	Fixed	30.00	360.84	62.23
J-10	221.00	Zone	Demand	30.00	Fixed	30.00	363.62	61.71
J-11	254.00	Zone	Demand	30.00	Fixed	30.00	366.12	48.51
J-12	286.00	Zone	Demand	30.00	Fixed	30.00	371.40	36.95
J-13	228.00	Zone	Demand	30.00	Fixed	30.00	360.71	57.42
J-14	252.00	Zone	Demand	30.00	Fixed	30.00	360.48	46.94
J-15	220.00	Zone	Demand	30.00	Fixed	30.00	360.39	60.74
J-16	230.00	Zone	Demand	30.00	Fixed	30.00	354.11	53.70
J-1	310.00	Zone	Demand	30.00	Fixed	30.00	377.46	29.19
J-2	312.00	Zone	Demand	30.00	Fixed	30.00	375.85	27.62
J-18	315.00	Zone	Demand	30.00	Fixed	30.00	372.55	24.90
J-19	210.00	Zone	Demand	30.00	Fixed	30.00	362.04	65.78

